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ABSTRACT

This monograph details the findings from the fourth year of a 5-year Consumer Needs Assessment Project. Sixteen focus groups consisting of 133 working-aged persons (25 to 60 years old) with disabilities were convened in 3 different parts of the United States to discuss their personal and technological needs. Consumers identified problems they face in participating actively within their communities. They described attitudinal barriers, their need for human assistance, and obstacles to their use of public and private transportation and accommodations. They also considered workplace issues, including technology and its impact on their employment. They provided recommendations on ways to alleviate social and physical impediments in varied settings. They considered the implications of the Americans with Disabilities Act on these issues. The focus group participants also considered product design features, costs, instructions, repairs, and safety concerns. Consumers spoke about their need for objective information about products, and recommended developing working partnerships among designers, manufacturers, and consumers with disabilities. Consumer observations about specific products are noted, including mobility devices, telecommunication devices, televisions, and computers. Wish list items wanted by individuals with blindness and visual impairments, deafness and hearing impairments, manual dexterity impairments, and mobility impairments are described. A moderator's guide for use with focus groups is attached. (JDD)

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ELECTRONIC INDUSTRIES FOUNDATION

Report

LISTENING TO THE EXPERTS

THE VIEWS OF WORKING-AGED CONSUMERS WITH DISABILITIES

Consumer Needs Assessment Project Year Four

RESULTS OF THE FOURTH YEAR OF A FIVE YEAR STUDY

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July 1992

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SUMMARY

The following monograph details the findings from the fourth year of the Electronic Industries Foundation Rehabilitation Engineering Center's ongoing Consumer Needs Assessment Project. Sixteen focus groups consisting of 133 working-aged persons with disabilities were convened in three different parts of the country to discuss their personal and technological needs.

Consumers identified problems they face in participating actively within their communities. They described attitudinal barriers, their need for human assistance, and obstacles to their use of public and private transportation and accommodations. They also considered workplace issues, including technology and its impact on their employment. They provided recommendations on ways to alleviate social and physical impediments in varied settings. They considered the implications of the Americans with Disabilities Act (ADA) on these issues. Many of their solutions have implications for product design and use which are described in the monograph.

Focus group participants were forthright in explaining their product needs. They outlined design features that either allow or impede their use of products. They spoke of cost, control features, product instructions, repairs, and safety concerns. They shared their recommendations for product improvements.

Consumers sought access to all kinds of devices and services, many of which are currently unavailable to them. They spoke in detail about barriers to learning about many kinds of devices, and wanted objective information about products so that they could make thoughtful purchasing choices.

Participants strongly recommended developing working partnerships among designers, manufacturers, and consumers with disabilities. Such collaboration would ensure the creation of products that are useable by persons with diverse functional limitations.

Consumers felt it was important that manufacturers provide them with a range of choices on product design and features. They suggested ways that these aims could be accomplished. The richness of their recommendations is suggested by the many comments and thoughts they shared. They did not, however, seek to dictate specific criteria for companies to follow.

Participants realized that their needs differ, and that no single solution will answer all problems. They provided general guidelines and recommendations to allow manufacturers flexibility in how they respond to varied, and often contrasting consumer needs.

I. Overview

The Rehabilitation Engineering Center of the Electronic Industries Foundation (EIF) has completed the fourth year of a five year Consumer Needs Assessment Project designed to identify the technological needs of consumers with disabilities. Funded under a Cooperative Agreement with the National Institute on Disability and Rehabilitation Research, this study employs focus group research techniques to learn from individuals with functional limitations about the role technology plays in their daily lives.

Each year, consumers with disabilities are recruited to participate in EIF sponsored focus group sessions held in three different sections of the country. An experienced moderator poses open-ended questions about technology issues in meetings which last between two to three hours. Consumers discuss their attitudes about and experiences with an array of products. Participants comment on assistive devices and general consumer products used in the home, workplace, and other community settings.

The EIF focus group sessions cover a wide range of topics.[1] Consumer opinions about design features that facilitate or impede their use of technologies are solicited. Participants are questioned about the adequacy of their information sources on products and the criteria they use when deciding to purchase such devices. They identify wish list items, products that may or may not exist in the marketplace, that they want or need. Their advice to product manufacturers is also sought.

Technology is not the only issue that focus group members discuss. The sessions also provide opportunities for consumers to voice their opinions on unmet needs which affect their quality of life. These needs may influence their use of products or may be entirely outside the realm of technology. This information, nonetheless, enhances understanding of consumer self-perceptions.

Different categories of persons with functional limitations are studied each year. Focus group sessions are tape recorded and transcribed, the findings are analyzed, and a monograph highlights project results.[2]

The purpose of the Center's Consumer Needs Assessment Project is to disseminate data gathered from consumers with disabilities about their characteristics and product needs. The study seeks to sensitize manufacturers and help them to identify product ideas, problems, and possible solutions for research and development.

Focus group sessions provide a method for gaining insights into the experiences of persons with disabilities. Sharing this information can help promote the development and use of appropriate technologies for increased independence, productivity, employment, and enhanced quality of life for this target population. The findings often highlight the unmet needs of persons with disabilities so that policy makers, consumers themselves, and members of the general public can advocate for public policy changes to promote necessary improvements.

II. Research Methodology

In Year Four of the Consumer Needs Assessment Project, EIF's Rehabilitation Engineering Center conducted focus groups in these areas: the Midwest, the South, and the Northeast.[3] EIF sought assistance in recruiting focus group participants from many sources. Local hosts and organizers included staff members of state projects that are recipients of federally funded Technology-Related Assistance grants, personnel from an EIF affiliated employment project (known as a Project With Industry), service providers from voluntary organizations, independent living center personnel and volunteers, and an officer of an access center that operates in a public library. Several consumers encouraged and enlisted fellow participants to attend focus group sessions.

In keeping with the research procedures used in past years, participants were not randomly selected. They were known to the local organizers because they are associated with community programs and support groups or are active within the disability community.

A. Criteria for Participation

EIF's Rehabilitation Engineering Center asked local organizers to recruit individuals with functional limitations who are of working age: 25 to 60 years old. The age boundaries were established intentionally to exclude wherever possible younger individuals in educational or training programs intended to lead to employment and older persons who may have recently chosen voluntarily to leave the workforce.

In each geographic setting, local organizers were asked to bring together four separate focus groups, divided according to single functional limitation categories. The sensory limitation groupings included individuals with auditory impairments and those with visual impairments. The physical limitation groupings consisted of consumers with mobility disorders, and those with manual dexterity impairments.

All sites would host two groups of individuals who are employed, and two who are unemployed. EIF requested that individual focus groups consist of between eight and twelve persons, although attendance was sometimes larger or smaller, depending on turnout.

Strong consumer response and interest among agencies serving persons with disabilities caused two organizers to arrange additional groups. In the Midwest, seven consumer focus groups were held, and a discussion group of service providers met informally with the EIF moderator to share ideas and seek project information. A Northeast organizer, responsible for assembling an auditory limitations group, recommended that EIF conduct two groups within this category. Recognizing that their needs may differ, she arranged one group that consisted of persons who are deaf and another that was comprised of individuals who are hard of hearing. A total of sixteen focus groups consisting of 133 participants were conducted.

Generally, local organizers were able to meet the Center's criteria for focus group participation, although variations did occur. Some groups had members above the age limit or who were students. Others had a mix of employed and unemployed persons. Many participants had

multiple impairments and could have been candidates for more than one group. One nonverbal focus group member used an electronic augmentative communication device to articulate her ideas. Other such participants depended upon manual communication boards. Several consumers, unable to attend focus group sessions but interested in having their opinions known, sent written comments or had individual telephone conversations with the moderator to facilitate their participation in the project. In spite of these events, each functional limitation category had distinct focus groups that represented employed and unemployed persons.

B. Rationale for Examining the Needs of Working-Aged Persons with Disabilities

EIF sought to explore the needs of working-aged persons with disabilities because they are an underutilized resource. They experience high levels of unemployment and underemployment. According to data from the 1987 Current Population Survey, 13.3 million people aged 16-64, representing an estimated 8.6% of the working-aged population, had a work disability which prevented or limited them in their capacity to gain or retain employment. Only 19.7% of them sustained a full-time job, a percentage which was 2.5 to 5 times less than their non-disabled counterparts.[4]

The economic consequences of this joblessness cause impoverishment and dependence for many people with functional limitations. A July 1989 Census Report found that approximately 28% of people with a work disability were living in poverty and many others were "near poor," whereas 11% of the total working population fit this description.[5] In addition, findings from the first three years of EIF's Consumer Needs Assessment Project confirmed that employment is a crucial concern of many who participated in the focus groups. It was perceived as a need that often superseded technological concerns.

The technology needs of working-aged persons with functional limitations, whether they are employed or unemployed, take on additional importance in light of the passage and implementation of the Americans with Disabilities Act (ADA), sweeping civil rights legislation which prohibits discrimination on the basis of disability. The ADA requires large segments of the business community, public service facilities, and public accommodation establishments to provide "reasonable accommodations" for employees and customers who have disabilities. Questions regarding workplace issues and public accommodations were raised during the Year Four focus group sessions. Focus group information can provide employers, product designers, and manufacturers with information that will assist them with ADA compliance.

Other factors prompted examination of the consumer needs of working-aged persons with various disabilities who are either employed or unemployed. The decline in the nation's birthrate and the aging of the population have led to forecasts of labor shortages in the coming decades. The scarcity of qualified workers may provide a window of opportunity for the employment of persons with disabilities. For individuals who are unable to compete in the workplace, technology may increase their capabilities both in vocational and non-vocational areas. Center staff felt it would be valuable to compare the knowledge, exposure, experience, and attitudes towards technology of working-aged persons with disabilities who are employed with those who are unemployed.

III. Unmet Consumer Needs

EIF focus group members are encouraged to share information about their unmet needs, whether or not they are directly related to technology issues and Year Four participants were no exception. The issues discussed mirror findings from past years of the Consumer Needs Assessment Project.[6]

The participants provided insights on obstacles they face which can have an impact on their willingness and ability to use products. Consumers identified the following needs that affect their quality of life.

A. Need 1 — Educate the general public to dispel ignorance about and discrimination towards persons with disabilities.

1. The Problem

Focus group participants in all functional limitation groupings acknowledged the difficulties of overcoming attitudinal barriers. Examples were given to show that members of the general public, work colleagues, and business people often make incorrect assumptions about individuals with disabilities, their needs, or who they are. Participants complained about situations where they were patronized or neglected because of their functional limitations. Wish list items such as an "I.Q pill for sighted people" or "teaching people how to communicate with deaf or hard of hearing people" reflected consumer frustration with these negative attitudes.

2. Solutions

Education was cited as the primary tool for changing these attitudes. While recognizing their ability to act as teachers and role models, focus group participants made other recommendations to help in modifying behaviors. A sampling of these ideas follows.

a. Blind and Low Vision Focus Group Findings

Blind and low vision focus group participants suggested realistic media coverage of persons with disabilities, avoiding inappropriate portrayals of them as heroic figures or objects of pity. They also discussed the need to inform the driving public about pedestrian right of way laws and mobility devices such as canes.

b. Deaf and Hard of Hearing Focus Group Findings

Deaf and hard of hearing focus group members proposed training programs for public servants such as police officers and hospital staff to help them work and communicate effectively with citizens who have auditory limitations. Workplace training films need to be captioned, and supervisors, work colleagues, and salespeople, must learn to take the time to communicate in writing when interpreters are not available. Television shows and commercials should include more characters who are hard of hearing or deaf.

c. Manual Dexterity Focus Group Findings

The Americans with Disabilities Act was considered as a tool for attitudinal change in many focus group sessions. Consumers were generally cautious and often skeptical about the law's actual impact. A focus group consisting of persons with manual dexterity impairments hoped that ADA would hasten the acceptance and recognition of the diverse needs of the disability community.

d. Mobility Impairment Focus Group Findings

A focus group of employed persons with mobility impairments discussed negative attitudes towards employees with disabilities in the workplace. One participant recounted situations where she was asked why she was not "home on disability." Others saw that as a reason to encourage workplace initiatives to eliminate such opinions.

3. Implications for Product Design and Use

Negative societal attitudes about persons with disabilities are often transferred to products developed specifically for this diverse target population. In a focus group of hard of hearing participants, one member spoke about the stigma attached to persuading consumers to use assistive technologies such as hearing aids and text telephones. The development of aesthetically pleasing products could make consumers more partial to trying out devices. She also recommended the development and dissemination of upbeat marketing campaigns which emphasize that consumers who employ such equipment are integrated into mainstream society in a very positive way. Catalogues should not show products in isolation but as a part of an active lifestyle.

B. Need 2 — Recognize the Importance of and Provide Human Assistance to Persons with Functional Limitations

1. The Problem

Focus group participants realized the utility of assistive devices and general consumer products as tools to help them function independently. In many instances, however, they explained that products cannot take the place of human assistance. Each category of consumers with disabilities required this type of aid.

2. Solutions

a. Blind and Low Vision Focus Group Findings

Consumers who are blind or have low vision spoke of their need for individuals to read documents to them. Electronic print reading devices, while convenient and attractive, were not always affordable. Many items such as notices on workplace bulletin boards, handwritten letters, or faxed materials are difficult or unintelligible on conventional reading machines.

Several consumers sought access to informed salespeople when deciding to purchase assistive technologies or general consumer products. Employed persons wanted more electronics companies to employ troubleshooters who could answer business-related equipment questions in a timely manner.

b. Deaf and Hard of Hearing Focus Group Findings

Focus group participants who are deaf or hard of hearing discussed their need for sign language and oral interpreters in varied settings. The cost of interpreting services was identified as the reason why such assistance was often lacking while low pay for interpreters was also criticized as a disincentive to individuals entering the profession. Interpreters were used in many of the Year Four focus group sessions.

Technology, computer assisted real time captioning (known as CART services), and human assistance benefitted several EIF focus group members in one meeting. A trained court reporter transcribed the meeting proceedings on computer; the text was projected on a screen so that participants could converse and follow the discussion via printed word.

c. Manual Dexterity and Mobility Impairment Focus Group Findings

Members of manual dexterity and mobility impairment focus groups discussed the problem of finding and keeping personal care attendants (PCAs) on whom they could depend. Cost of services was also a factor. A participant complained, "I don't make enough to pay for attendant care.... So, I'm always in the hole, barely making it.... They'll pay for a device that costs three to four thousand dollars, but they won't give me money to supplement things like [attendant care]...." Focus group members saw this as a rallying point for different disability groups to work on cooperatively.

A participant attempted to find and employ an attendant with mild or moderate mental retardation through local advocacy groups but had no success. Other responses to this need included such wish list items as "mechanical PCAs" and interest in the development of devices that would allow individuals to accomplish routine tasks independently.

3. Implications for Product Design and Use

Consumers seek and appreciate devices that enable them to be self-reliant. In the product arena, consumers value help from knowledgeable sales people and service representatives on devices they purchase and use.

Human assistance, however, continues to be an important component in the spectrum of services needed and wanted by individuals with disabilities. The cost, recruitment, and retention of capable individuals as readers, interpreters, and PCAs to provide assistance to persons with disabilities are major public policy issues that require a comprehensive response.

C. Need 3 — Provide User Friendly, Reliable Methods of Public and Private Transportation

1. The Problem

Transportation is a necessity, providing users access to activities outside the home. It can facilitate or hamper employment, recreation, or participation in community life. In many places, public transportation is limited. Late evening, holiday, and Sunday bus service was non-existent in midwestern and southern focus group sites. As one focus group member explained, "We're not a mass transit town. We're a car town."

Northeastern participants who lived in areas with extensive bus and subway systems criticized public transportation because of accessibility issues. For instance, not all subway stations are wheelchair accessible causing passengers to go out of their way when using public transit. Airline travel also poses many hurdles to these consumers.

Members of mobility impairment focus groups spoke of budget cuts affecting wheelchair lift bus service. In one site, participants discussed how their transit system cannot fund both wheelchair lifts on public buses and subsidize a separate wheelchair transportation service. An employed participant examined the cost of using a private wheelchair transportation service to get to work. It was almost equivalent to an hour's worth of his pay. While the Americans with Disabilities Act covers transportation issues in Titles II and III, consumers were aware that certain localities were applying for waivers to compliance. These problems were identified with no specific recommendations to alleviate the situation.

Some consumers complained about taxi service in their communities. It was not uncommon for them to wait from 45 to 90 minutes for a cab ride after calling. Such unpredictable service affects everyone, not only persons with disabilities. Additionally, ideas regarding car modifications surfaced during focus group sessions. Rural and urban focus group participants in all disability groupings had recommendations for improving their transit systems.

2. Solutions

a. Blind and Low Vision Focus Group Findings

Focus group participants who are blind or visually impaired suggested changes in bus, cab, and airline systems. Audio notification on buses, alerting passengers to upcoming stops, was proposed. Talking cab meters, activated when a rider enters and prepares to leave a taxi, were recommended as a means to inform riders of their correct fare. Arrival and departure gate information should be available in audible form.

The dangers of being a pedestrian were also discussed. Some consumers supported the use of audible traffic signals, particularly in areas unfamiliar to them; others felt that hearing is the best cue to rely on.

b. Deaf and Hard of Hearing Focus Group Findings

Deaf or hard of hearing focus group members advised the use of visual signals in cars, on buses, subways, and airplanes. Sirens on ambulances and police cars need strong blinking lights, visible in all kinds of lighting conditions, to alert deaf or hard of hearing drivers of their presence. Honking horns or other warning signals should be supplemented by visual cues for this segment of the driving public.

A visible symbol should be displayed on buses to inform passengers that an audible bell has registered an exit request. Verbal announcements explaining subway delays or problems ought to be augmented by printed bulletins on central message boards. Captioning or audio loops on airplanes needs to be available for announcements, explanation of weather problems, or routes. One focus group member even proposed captioning for the car radio to alert drivers to accidents and road problems.

c. Manual Dexterity Focus Group Findings

Participants in the manual dexterity focus groups concentrated on car and van modifications. Power steering was often very sensitive. The multitude of controls on the end of the turn signal lever were identified as a problem by some users. It was hard to activate one control without setting off others. The short base of the steering wheel was unsteady to handle. One participant solved this situation by moving the dimmer switch of his vehicle to the floor. Another consumer discussed using foot controls on his van. Participants unable to drive complained about scheduling services through Red Cross or bus transportation.

d. Mobility Impaired Focus Group Findings

Members of the mobility impairment focus groups recommended vehicle modifications. Electric and swivel seats were seen as ways to enter and exit cars easily. Many participants rely on hand controls in their cars or vans.

3. Implications for Product Design and Use

Technology can help make public and private transportation systems increasingly accessible to consumers with disabilities. Consumers identified specific ways that transportation systems could become more useable for them. Such recommendations could assist states, localities, and private entities to better serve this clientele, in compliance with ADA regulations.

D. Need 4 — Provide Accessible Public Accommodations

1. The Problem

Many barriers exist which prohibit consumers with disabilities from using public accommodations and services. Participants recognized the difficulties that institutions and businesses

face in responding to their diverse needs, but felt that changes could be made to ensure increased access.

2. Solutions

a. Blind and Low Vision Focus Group Findings

Consumer who are blind or visually impaired sought voice components on Automated Teller Machines (ATMs), in restaurant menus, on shopping mall maps, TV touch screens in shops, and grocery store scales. Telephone visual displays need to be augmented by audio presentations of the same materials. TV announcements about the weather, sports scores, and stocks should be verbalized for this population. Other recommendations included standardizing ATMs and public restrooms, since variations are problematic for these consumers.

b. Deaf and Hard of Hearing Focus Group Findings

Participants who are deaf or hard of hearing wanted visual displays on ATMs, printed menus where they could point at what they wanted in fast food and drive-through restaurants, alternate means to access business and home audio intercom systems, and good lighting in public settings.

They asked for comprehensive captioning on movies in theaters, TV programs, advertising, and on all videos. One participant reasoned that since he pays the same amount that other video customers do, he deserves equal access to information.

Consumers felt hospitals and other public facilities should have amplified telephones, text telephones, written procedures, assistive listening devices, and TV captioning. Cash registers in stores should be positioned so that customers can read the totals. Consumers also requested modifications on security systems in banks and stores. Such systems cause terrible sounds to emit from FM dual system hearing aids.

c. Manual Dexterity Focus Group Findings

Focus group members with manual dexterity limitations recommended standardization of ATMs. The machines can be difficult to reach from a vehicle, and customers often need the use of both hands to deposit funds.

Much discussion occurred concerning restroom accessibility. Many of the same issues surfaced in the mobility impairment focus groups. Latches on stalls are often hard to close, toilet paper dispensers need to be lowered, and restroom doors should be easier to enter and exit. Other suggestions including making electric carts available in grocery stores, and widening store aisles.

d. Mobility Impairment Focus Group Findings

Consumers with mobility impairments discussed hotels, motels, public restrooms, elevators, and doors. They wanted more roll-in showers, railings in bathrooms, and shower stalls without

ledges two to three inches high. Many hotels will not supply tub benches or allow customers to bring their own because of liability issues.

Public restrooms are often too small to enter if one uses a wheelchair or scooter. The same is true for elevators. Participants also complained that elevators are often not timed for slow entry. They recommended changes including talking elevators, recognizing that wheelchair users often have their back to the elevator control panel and need to know where they are.

Drive-through ATM machines could be improved. The keyboards could be located so that the window of one's vehicle was positioned in a way that the customer could easily key in to the automatic teller machine.

Participants felt that public buildings needed more automatic doors. For businesses with limited funds, some consumers suggested placing a doorbell at wheelchair height so entrepreneurs could assist customers who need to enter their buildings.

Grocery stores also came under review. Consumers suggested that more stores offer electric shopping carts and home delivery services. A participant thought that a drive-through window where one could order and wait for groceries would be convenient. Someone else suggested increased opportunities for grocery and clothes shopping from home.

3. Implications for Product Design and Use

With the implementation of the Americans with Disabilities Act, public accommodations and commercial facilities are required to respond to the needs of consumers with disabilities. Many focus group participants encouraged designers, manufacturers, and architects to turn to users for advice and guidance. Since businesses need to comply with the law, it will become more profitable for manufacturers to develop and make products that can be used by those with functional limitations and the industries that employ and serve them.

IV. Experiences in the Workplace

A. Overview of Work Disincentives

Focus group participants, regardless of employment status, recognized the psychological and economic benefits of working. Although the impact of the Americans with Disabilities Act on employment was addressed in many focus group sessions, consumers still identified serious obstacles to job placement and retention.

Some raised attitudinal issues, wondering whether employers would willingly give workers with disabilities a chance to prove themselves on the job. Physical barriers, such as transportation or the accessibility of workplace settings, also came under group scrutiny. The most nettlesome issue, however, concerned the loss of social security benefits for persons with disabilities who enter the workforce.

B. Benefit Constraints

Participants articulated the financial and emotional impact of the benefit dilemma. One consumer, employed part time because of limited stamina, commented, "If I make over $500 a month, I will lose $1,900 in benefits.... It's a tragedy. It's keeping people from maintaining a dignified lifestyle."

An unemployed participant shared her story during a focus group session. She received Supplemental Security Income (SSI) and Medicaid before joining the workforce. Health problems interfered with her employment, and forced her to resign. She was unable to regain benefits after her job ended. She said, "I would have done better if I had never done anything. But what kind of life is that? So now I do volunteer work...it's not that I can't work, it's not that I don't want to work, but what happens if [my health deteriorates]? I lost a lot."

Access to employee health insurance benefits is a problem for newly hired persons with disabilities. An employed participant discussed the difficult transition from receiving Medicare and Medicaid to having a trial waiting period before he could qualify for health insurance offered by his employer. Many people expressed the fear of forfeiting Social Security and medical benefits, particularly when their earning ability is unlikely to equal the financial loss they would sustain.

1. Solutions

- Enforce the Americans with Disabilities Act

Consumers envisioned using federal legislation to promote the employment and retention of persons with disabilities in the workforce. ADA was seen as a means to ensure employees access to devices to help them perform their jobs. It would also provide them with employment protection.

Common fears were that companies would attempt to circumvent the law and enforcement efforts would be ineffective. Participants felt that case law was needed to clarify the ADA. Many individuals are still unfamiliar with the Act and consumers worried that businesses would follow a crisis approach to compliance efforts.

- Reform the Social Security Benefits System

Incentives could be developed to encourage persons with disabilities to work without causing the concomitant loss of needed Social Security or medical benefits. A consumer recommended a system similar to that which is applied to retired persons. Social Security benefits could be reduced based on the working person's income. Wages earned would be taxed, creating revenues for the government and generally benefitting society. It would encourage persons with disabilities to maximize their earning potential.

Revision of P.L. 99-643, the Employment Opportunities for Disabled Americans Act was suggested. The legislation, which provides special benefits or Medicaid coverage to those who

perform substantial gainful activity despite a severe medical impairment, should be extended to cover workers with disabilities who await employee health insurance benefits.

2. Technology in the Workplace

Employed persons with disabilities who participated in the Center's focus groups often provided specific suggestions on how products they use in the workplace could be improved. Knowledge levels about sophisticated, high technology devices and less complex office equipment varied, depending on each worker's position, level of exposure, training, and proclivity towards specific products.

Similarly, unemployed persons shared their ideas about products they might rely on within a work environment. Some unemployed consumers appeared less comfortable speaking about hypothetical work environments. It was most typical for persons who volunteer in office settings or who had worked for a period of time to comment on these issues, although several unemployed participants were well-acquainted with technologies that could be used either in the home or the workplace.

a. Blind and Low Vision Focus Group Findings

Employed consumers who are blind or visually impaired complained about products that employ visual commands. Xerox machines, laser printers, gages, dials, or light emitting diode (LED) displays need audible or tactile cues for this population.

Several participants identified assistive devices they use in the workplace including computers operated with adaptive software that enlarge print on the screen, speech synthesizers, closed circuit televisions, Optacons (a high technology print reading device), Versabrailles (a computer with a braille keyboard that provides a paperless, braille display), talking calculators, and magnifying glasses. They perceived these devices as equalizers in the workplace.

When problems surfaced with equipment on the job, consumers complained that some assistive device companies were unresponsive to their needs. Examples cited included manufacturers who did not know whether their devices were adaptable to mainstream computer equipment and would not guarantee refunds if their products were incompatible. Lengthy equipment repairs or delayed responses to consumer questions about product use caused difficulties for workers. Employed participants sought timely, effective, and informed services from manufacturers.

Several employed consumers raised technology concerns regarding the hiring of new employees with disabilities. They wondered how many businesses would willingly invest in purchasing expensive equipment for new workers who have not had the opportunity to prove themselves in their companies. They spoke of the difficulty of having timely access to technologies as a new hire.

Although funding for such devices is often available through state vocational rehabilitation agencies, one focus group member explained, "The big problem is having equipment available when

you first get the job. If you have to go in and apply...and they ask you when can you come to work and you tell them I have to wait months for equipment.... It's hard to get a job that way."

Working focus group members also discussed the overwhelming number of available technologies. One participant asked, "With so much technology, how can job applicants be familiar with it all?" Several people recommended that job seekers with disabilities have exposure to and be trained to use equipment before they enter the job market.

Unemployed consumers spoke about the recession, and its affect on finding employment. Some non-working participants were very knowledgeable about assistive technology and general consumer products, and others who were less informed managed to receive useful device information from their colleagues during the focus group sessions. One participant, for example, sought a typewriter that could compensate for line differentiations when completing forms. Others suggested computer software to respond to this problem.

b. Deaf and Hard of Hearing Focus Group Findings

Employed deaf or hard of hearing focus group participants discussed their need for amplification (on such devices as telephones) and for visual displays (on computers and other worksite equipment), or beepers that vibrate (for fire alarms). Amplification and simultaneous translation of business meetings via computer, CART services, were also sought.

A consumer mentioned that the sound frequency of certain devices can affect an employee's ability to use them. An individual may not be able to feel the vibration of high frequency sound devices, but is more likely to feel low frequency sound.

Other worksite modifications were considered in focus group sessions of employed persons. For instance, the way an office is arranged can affect whether the deaf or hard of hearing worker is aware that someone else has entered the room.

One participant outlined recommendations made at his worksite by an advisory committee consisting of employees with disabilities whose mission was to promote ADA compliance. The committee sought strobe lights in every room, bathroom, and hallway to alert workers in case of fire. It wanted text telephones wherever pay phones were located. The text telephones would need to be plugged into AC outlets since their batteries would otherwise run down. The committee recommended that text telephones be placed in a private area to avoid rubbernecking by employees unfamiliar with the device and interested in watching others use it. The group suggested having assistive listening devices available at all office lobby counter areas. It also requested hearing aid coverage in the company health insurance package.

An interesting discussion about the Americans with Disabilities Act and its implications took place in a focus group of employed persons who are hard of hearing. One individual commented that nothing in the law actually describes equipment design issues or criteria. Another felt this was a mistake since manufacturers would not be obliged to modify products. However, the first speaker explained that he would not want the law to outline specific types of technology, particularly since

no piece of legislation could adequately predict what consumers will require in the future. He felt businesses needed to figure out how to become accessible.

Many consumers pointed out the importance of involving persons with disabilities directly in the decision making process of how they should be accommodated in the workplace. They cited examples of management making inappropriate judgements about their needs, and wasting resources on devices that went unused.

In a focus group of unemployed persons, the volunteer experiences of one participant helped her identify her worksite needs. She sought telephones that were hearing aid compatible, and a vibrating bell to let her know whether other people had entered her office space. She also wanted visual displays on her typewriter to inform her of when she was at the end of a line of type.

c. Manual Dexterity Focus Group Findings

Employed persons with manual dexterity limitations used speaker phones, computers, and keyboard rests for typewriter and computer terminals at the workplace. One participant was given a three wheeled bicycle to ride in a shop area where vehicles were field tested. He found that, "in the workplace...once they know you and what you can do, most companies will provide you with the means to do it."

Getting into and out of restrooms, and opening doors were problems participants cited. Automatic doors were recommended to alleviate some of these difficulties.

Several unemployed participants had worked, but the unpredictability of their medical conditions made employment a questionable goal. One focus group member, battling fatigue, felt that her former employer did as much as possible to accommodate her, but she was unable to continue working. At first she felt that no assistive devices would have made a difference. Later in the session, however, she commented that perhaps a scooter would have helped her conserve energy, thereby allowing her to concentrate on her work.

d. Mobility Impairment Focus Group Findings

Working people with mobility impairments used computers, cassette recorders (to dictate notes), calculators with big buttons, typing sticks, electric wheelchairs, and scooters at the workplace. One participant fought to get a desk that would be a good work station for her, i.e., one that she could pivot under easily when using her electric scooter. Another focus group member mentioned that file storage is often inaccessible. He thought an automatic file drawer opener would be a practical solution to this problem.

Handicapped accessible parking spaces located near building entrances was a wish list item for one worker. She feared for her safety in the office parking lot, explaining that in the dark, using her wheelchair, she was "hood high." This position made it difficult for other drivers to see her.

Physical environments often posed problems for workers. Inaccessible bathrooms, stairs, door locks that were too high to reach, and traveling to job sites were covered in focus group sessions. Most participants in such situations believed their workplaces were attempting to respond to these issues. Others felt their employers were insensitive to their needs. They spent time trying to familiarize less knowledgeable managers with federal laws prohibiting discrimination at the workplace.

One participant who worked in his home, felt he could perform in an office setting if he had the ability to lay down and rest at the workplace. This would be a reasonable accommodation for him.

Unemployed persons with mobility impairments discussed the difficulties of finding work, and disincentives to employment. Specific devices related to the workplace were not identified by these groups.

3. Implications for Product Design and Use

Businesses that hire and serve people with disabilities are required to comply with the Americans with Disabilities Act. EIF Year Four focus group sessions showed that employees who have functional limitations need and use devices which enable them to be more productive in the work environment.

Employed consumers discussed a range of products, including assistive devices and standard business equipment. They explained their need for reliable servicing of devices they operate, and the importance of certain design features which can allow them access to standard office products.

Device manufacturers could broaden the scope of their markets in the work environment by heeding the advice of working consumers with disabilities. They may also benefit by adapting their products for businesses that must provide equal access to their facilities and services for customers with disabilities.

V. Product Features

EIF Year Four consumer participants were similar to their counterparts from the first three years of the study in their willingness to describe product features that enhance or impede their capacity to use products effectively and efficiently.[7] Many themes emerged during the focus group sessions. Several product characteristics, however, were universally identified as issues consumers must weigh when they consider purchasing devices. They included:

- cost;
- control features;
- instructions available in accessible formats;
- repair issues; and
- safety.

Additionally, several focus group members confronted product compatibility problems. A review of these design features is presented below.

A. Cost

1. The Problem

Consumers in all functional limitation groupings criticized the price of products they use and depend on. This finding has been consistently identified in all four years of the Consumer Needs Assessment Project.[8]

Assistive technologies came under serious scrutiny. Participants were often forced to go without certain items, to make purchases according to what they could afford, or to procure devices on a piecemeal basis, depending upon their available financial resources. They expressed frustration because of their predicament, i.e., needing equipment but being unable to finance it. One participant explained the issue succinctly, "Cost makes many products inaccessible...they [the products] might as well not exist."

Participants discussed assistive technology payment methods. The cost of many devices must be borne by consumers directly. Public and private insurance plans covered certain medically related devices. Purchase approval by these third party payers was described as a lengthy process. State departments of vocational rehabilitation or employers often financed equipment used by employed consumers with disabilities. Consumers, however, saw no clear pattern as to why some products are financed, while others are not.

2. Solutions

- Increase competition so the price of products comes down.

The high price of assistive technologies is often attributed to the small number of companies that manufacture and sell these specialized products for persons with disabilities. Device manufacturers perceive their target population as a small market with limited resources. Consumers cited as an example the availability of competing electronic reading systems. Technology prices were lowered when two companies offered similar products at substantially different prices, forcing price cutting to occur. Focus group participants hoped this form of competition would grow to their benefit.

- Develop strategies to help finance equipment, including government or insurance subsidies, private funding initiatives, easy payment plans, and low interest loans for assistive technologies.

Several consumers knew of funding initiatives available through businesses and voluntary agencies, but awareness of these programs was not widespread. Participants sought more opportunities to purchase devices using these kinds of payment strategies.

- Develop legislation to spread the costs of technologies that benefit persons with disabilities throughout the general population.

Consumers who are deaf or hard of hearing mentioned the Television Decoder Circuitry Act of 1990, P.L. 101–431, which requires manufacturers who sell their products in the U.S. to equip all televisions that have picture screens 13 inches or larger with decoder circuitry designed to display closed captioned transmissions. The law will take effect in July 1993. The cost of this modification will be passed along to all purchasers of televisions, ensuring that the price will be affordable for consumers, including those who have disabilities.

Focus group participants justified the cost increase by explaining that they often pay for features they cannot use on products that they purchase. This legislation will provide them equal access to the medium of television. Consumers suggested that legislation of this kind could be applied to other assistive technologies.

- Provide tax deductions for assistive technologies, like hearing aids or other products that are not considered medical devices under the tax code.

A focus group participant used the hearing aid as an example of a technology that should qualify for a tax deduction. It is not viewed as a medical device for income tax purposes, yet it is an expensive and essential device for many consumers. Several participants questioned the reasoning behind why some devices qualified for such deductions while others did not. Several consumers viewed this issue as a matter of fairness.

- Enact a limit on charges that government programs would pay for assistive technologies.

Some focus group participants asserted that assistive technology prices could be lowered through government intervention. They recommended price controls as a means to cut technology costs. They did not, however, discuss the impact of such a recommendation on assistive devices companies.

B. Control Features

1. The Problem

Consumers must often manipulate controls to activate products. Dials, knobs, levers, electronic touchpads, and switches can be obstacles to independent product use for many individuals with functional limitations. Feedback that shows the user whether the individual is using a product correctly, or has turned on or shut off the device may occur in an inaccessible format. This is a universal issue, and focus group participants had diverse recommendations for making control mechanisms accessible.

a. Blind and Low Vision Focus Group Findings

1) The Problem

A participant in a blind and low vision focus group discussed the house of the future, describing it as having pushbutton controls with touch screens for video displays. Such a home would be inaccessible to this segment of the population.

A focus group member explained the reasons why the pressure sensitive control has come into vogue. He said, "It does not have moving parts. It's mechanically or electronically more efficient and much less prone to error. So we are going to see more and more of those on all kinds of appliances." Such flat, smooth control panels are difficult or next to impossible for consumers with visual impairments to activate accurately. Visual cues from these products also fail to provide usable feedback to these consumers.

Participants complained about small buttons on remote controls and panels. Some are too tiny to adapt for persons who are blind or who have limited vision. Distinguishing markings, such as Dymotape, cannot be placed on them. Dymotape has also been known to blow out circuits on some appliances. Other problematic controls include buttons that are pushed in and return to the same position while in use or smooth sliding switches which do not provide consumers adequate feedback.

2) Solutions

- Develop "touch friendly" controls that provide audio responses.

Controls that a user can feel or click to put in position were recommended by these consumers. Dials and knobs should be placed on the front of a device, differentiated by size, shape, and varied gradations.

One consumer recommended overlays for extraneous buttons on devices, another praised locker switches that allow the user to distinguish when a product is turned on or off. Consumers suggested audio feedback on devices they operate.

- Use color differentiations, or black on white contrasts on devices.

Consumers who have visual impairments can often benefit from the use of contrasting colors or shades on product controls. These visual cues can assist in showing dial or knob positions.

b. Deaf and Hard of Hearing Focus Group Findings

1) The Problem

Devices that use audio cues to inform consumers that they have been turned on or have shut off are troublesome for persons who are deaf or hard of hearing. Bells or beepers on such items as stoves, timers, alarm clocks, or doorbells need to be supplemented by visual indicators.

2) Solutions

- Include visual cues on products.

A consumer stated the issue succinctly, explaining, "Wherever there is [sic] sound, bells, or whistles, there's got to be lights." Any products using beeper or voice indicators, should include light indicators or written print-outs. Visual cues, relying on strong and possibly varied colored flashing lights, were recommended. Some people liked devices that vibrate, while others felt that could be too jarring.

- Develop sound level adjustments on, or print-outs from, varied devices.

A member of the hard of hearing focus group advised the creation of a control where the high and low frequencies, treble and base, could be calibrated for better clarity. She wanted to see this modification on such products as telephone answering machines. Written print-outs from products were also suggested.

c. Manual Dexterity Focus Group Findings

1) The Problem

Controls that require a two-step process, pushing in a knob or dial, then turning it into position, posed difficulties for consumers with manual dexterity problems. Devices where the use of two hands to manipulate the controls was called for (e.g., a digital alarm clock) were often inaccessible to this population.

Some participants complained about computer keyboards that easily recorded accidental strikes. Others expressed frustration with products, such as remote controls, that must be held at certain levels to activate or deactivate an appliance. They can be hard to maneuver.

The location of control mechanisms was a problem for some users. Small buttons, requiring delicate tactile movements, were not practical for many consumers with manual dexterity limitations. Several participants in these focus groups used mouthsticks to start, work on, or stop devices.

2) Solutions

- Develop more voice activated or eye guided devices.

Voice activated or eye guided products can allow users with manual limitations to activate products independently. Such devices were mentioned in several manual dexterity focus group sessions.

- Provide choices on control mechanisms and increase the amount of time available for control activation.

Consumer preferences varied on the types of controls they used successfully. Some liked rotary dials on telephones, others appreciated push button devices. Levers were favored by several participants, while others found pressure sensitive controls effective. A consumer discussed a predilection for controls that have a definite, tactile quality, somewhat stiff to the touch. Large buttoned, well-spaced controls were praised. Consumers suggested lengthening the allowable timeframe for activating controls since some of their hand movements tended to be slow.

d. Mobility Impairment Focus Group Findings

1) The Problem

Consumers with mobility problems were attuned to examining controls on devices when purchasing devices. One participant asked these questions when considering a new acquisition:

- Are existing controls in a position where I can get at them?
- Can I operate the controls, or make them operable through modifications?
- Are the controls easy to reach?

Control type, location, and size were discussed within these focus groups.

2) Solutions

- Develop voice activated devices.
- Provide choices on control mechanisms.

Several consumers sought enlarged buttons on controls, and placement of these mechanisms in front of a device (on stoves, washers, and dryers). Many of them used products from a seated position, making it difficult and sometimes dangerous to reach behind appliances. Touch activated lamps were perceived as a convenience by several users.

C. Instructions in Accessible Formats

1. The Problem

Focus group members explained that product instructions in manuals or on packaging often failed to be "user friendly" to consumers with functional limitations. Complaints arose over instruction formats that depended primarily on graphics, printed words, small type, convoluted language, audible directions, or bound manuals. Consumers suggested ways to respond to this issue.

2. Solutions

- Provide instructions in alternate formats.

Instructions should be made available to consumers through diverse media. Large print, braille, or audiotape instructions would benefit consumers with visual impairments. Audiotape manuals were also recommended by focus group members who had manual dexterity limitations and those with mobility impairments. They reasoned that audiotapes would alleviate the problem of turning pages in traditionally formatted instruction booklets.

In contrast, product users who are deaf or hard of hearing sought simple instructions with lots of graphic depictions. Since complex language constructions are often used in instruction manuals, one consumer even recommended sign language videotapes in addition to pictorial presentations. Focus group members sought varied formats that they could use independently to help them operate products.

D. Repair Issues

1. The Problem

Consumers in all disability groupings expressed concerns about product repairs. Several consumers sought equipment unlikely to breakdown. When considering a new purchase of a costly item, some participants rented the product to find out how well it worked.

Malfunctioning equipment, particularly assistive technologies, often cannot be fixed either by local service centers or handy "do–it–yourself" consumers. One participant complained that every nut and bolt on her roommate's electric wheelchair was different, prohibiting the focus group member from going to the hardware store and fixing this product herself.

A device may need to be sent out of town to the manufacturer for repairs. The response time for such service requests can take weeks or months. This is a hardship whether the product is used in the home or in the workplace (see page 12 for a review of workplace concerns related to repairs).

Participants pointed out that vendors are not available to handle service calls in the evenings or on weekends. Repairs, one consumer complained, can be almost as expensive as purchasing a new device.

Consumers who are deaf or hard of hearing raised additional concerns about repairs. They mentioned that it was difficult for them to know when certain devices needed servicing. For instance, when the refrigerator is noisy, it might require repairs but the consumer may not realize that a problem exists. If the washer is off balance, there are no visual cues on the machine to alert the user that adjustments are necessary. Although they may be able to feel if a device (e.g., a vacuum cleaner or a car) is not running correctly, consumers did report sink overflows or other mishaps because they were unaware of auditory warning signals.

2. Solutions

- Make loaner equipment available in cases where products malfunction and develop maintenance agreements for assistive technologies.

Participants recommended that manufacturers develop company policies to provide devices "on loan" whenever assistive technologies are in need of repair. Several participants explained that back-up devices were too costly to purchase. They would benefit from customer services that included device loans on an as needed basis. One consumer sought the availability of extended maintenance agreements.

- Have toll free phone numbers available for product questions and repairs.

Access to information on appropriate product use and repairs was seen as a practical consumer service. One focus group member wanted companies to implement a twenty-four hour text telephone number which would cover service issues and product questions for product users who are deaf or hard of hearing.

- Create local dealerships able to handle repairs of assistive devices.

Sending products out of town for repair can be time-consuming and burdensome. One consumer response to this problem would be to have more repair sites available throughout the country.

- Provide multiple forms of feedback on devices so consumers with different functional limitations can know when repairs are needed.

Visual, tactile, and audio cues would provide users with information on the servicing needs of their products. Such features would benefit consumers with disabilities.

- Standardize product components so that they are easy to access and to repair.

Focus group members felt that standard product components would allow them to service their assistive devices locally and in a timely manner. Consumers wanted to be able to visit general equipment service centers to have assistive devices fixed. This issue was raised in several sessions among consumers with different functional limitations. For example, focus group members wanted standardized components in such products as text telephones, audiocassette players, and electric wheelchairs. Additionally, equipment features subject to breakdown could be located so that they are easy to reach and to fix.

Component standardization would affect product compatibility. Several focus group members felt that standardization of product components would have applications beyond the realm of device repairs.

Some consumers complained about equipment incompatibility. Many devices do not interface with other products. For example, a participant wanted communication devices to have the capacity to be hooked up to different computers, or to run off the power of an electric wheelchair. She also recommended that the external plug on an electric wheelchair have the ability to power various devices. She used as an example, a friend who needed to have foods processed in a blender for easy consumption. Why not, she asked, be able to go into a restaurant and use one's own wheelchair to energize the food blender?

Lack of standardization, explained a participant who is blind, meant that users of specific computer screen reading programs need to learn whole new vocabularies for navigating different programs. He recommended the development of a standard connection that would plug into a piece of equipment and receive a list of standard codes, allowing it to run different devices. Standardization was perceived as providing consumers with many benefits.

E. Safety Issues

1. The Problem

a. Blind and Low Vision Focus Group Findings

Focus group participants were mindful of using products safely. One consumer explained it well, "The same kind of common sense that applies to a sighted person applies to a blind person." Another commented, "We cannot afford to be slipshod."

For some focus group members, discussions about safety revolved around health issues. Members of the blind and low vision groups commented on products they use to monitor their physical well-being, which include thermometers, blood glucose meters, and blood pressure devices. The cost of talking thermometers was decried. They also considered the location of stove dials, and the potential of sustaining burns when reaching over the stove to use the controls.

b. Deaf and Hard of Hearing Focus Group Findings

In the deaf and hard of hearing focus groups, participants sought safety related products such as accessible fire and burglar alarms. Concerns regarding the warning signals of ambulance, fire, and police vehicles were also covered (see page 8 for additional details).

c. Manual Dexterity Focus Group Findings

Members of several manual dexterity focus groups commented on the problem of using the ranges on their stoves. Pans can slip off the stove, causing spills and burns.

d. Mobility Impairment Focus Group Findings

Several safety concerns were raised in the mobility impairment focus groups. Safety testing of assistive technologies used by persons with disabilities was discussed. One participant told of a

fire in her home, caused by the safety buzzer on an environmental control unit (ECU) that had not undergone Underwriters Laboratories (UL) or an equivalent approval. She explained that such product evaluations cost tens of thousands of dollars, and manufacturers may decide not to subject a device to this type of testing when a technology only meets the needs of a limited market.

Reports of dangers posed by assistive technologies were not uncommon. Participants recounted stories of wheelchair joysticks that were cited as safety hazards, contributing to fires, ghost rides, and spins off curbs. A joystick's exposure to water can also cause an electric wheelchair to take off unexpectedly. Additionally, the electromagnetic effects of wheelchair and scooter batteries were considered. A consumer wondered whether constant exposure to this form of radiation posed a danger to product users.

2. Solutions

- Lower the cost of health related products.

- Create product features that assist in preventing injuries and that also promote safe use by persons with diverse functional limitations.

Dials, knobs, or levers placed on the front of stoves and other appliances can allow for easy and safe access for many product users with disabilities. Electric ranges were preferred by some focus group members who did not like using gas stove burners. Sauce pans with little feet were created for one participant. He could stir items on his electric stove without causing the pans to slide.

- Develop multiple forms of feedback from devices such as fire and burglar alarms and other warning systems.

For example, one consumer who is hard of hearing recommended that every home fire alarm have a visual component, whether those living there have a known hearing loss or not. She reasoned that providing several methods of alerting consumers could benefit a broad spectrum of people. Other persons who are deaf or hard of hearing recommended burglar alarms with flashing lights.

- Develop safety standards that assistive devices must meet to be placed on the market. Provide incentives to manufacturers to have their products undergo such testing.

Consumers recommended rigorous safety testing of devices such as joysticks, environmental control units, electric wheelchairs, and scooters to protect and provide them with assurances. Some participants suggested that placing circuit breakers in certain products could also help prevent accidents. Focus group members felt companies needed some form of inducement to cause them to have their products tested.

- Study the effects on consumers of extended exposure to electromagnetic radiation in wheelchairs and scooters. Consider whether some form of shield is needed to protect consumers.

Awareness of the strength of electromagnetic fields came up in a focus group exchange on laptop computers, augmentative communication devices, and wheelchair motors and batteries. A participant explained that a user can endanger and wipe out the memory of a laptop computer or an augmentative communications device if the individual carries or places the product near the wheelchair or scooter motor. Electric wheelchair or scooter use often interferes with television reception as well. Another example cited was environmental control units. They can disrupt the use of other electrical appliances when mounted on wheelchairs. Consumers wanted this problem studied and resolved.

VI. Supplementary Product Selection Criteria

In addition to the product features already discussed, focus group participants took into account varied factors when planning to purchase general consumer products or assistive devices. Ease of use, the ability of the consumer to make a product do what it is supposed to do, and the way a device handles were features cited. Portability, quality, and reliability were also addressed.

Some individuals preferred brand name items; others sought long lasting products whether or not their brand names were well-known. Several people mentioned device size, weight, height, and bulkiness as considerations. Others wanted to check whether they could easily modify the device so it was accessible for them.

Several participants sought to try out devices prior to purchase. Some consumers explained that they went to retail stores and tested general consumer products, such as television sets, on site. Others spoke of attending conferences where they could gain hands-on experience with devices.

Many complained about limited opportunities for experimentation with assistive devices before product acquisition. One consumer solved the problem of restricted access to devices by renting several different scooters to figure out which one best suited her needs. Another participant searched for products that offered reasonable return policies.

VII. Access to Product Information

A. The Problem

Consumers explained that product selection involves a three-step process — identification of a need, exploration of existing product solutions, and acquisition of devices that respond to it. Participants generally felt confident about their ability to articulate their technology needs, a skill that was evident during the focus group sessions. They recognized that different sources of information existed for general consumer products and specialized equipment for persons with functional limitations. Participants suggested numerous methods for collecting data about all kinds of devices.

Television and radio commercials, magazine and newspaper advertisements, and word of mouth were the traditional methods by which consumers with disabilities learned about general consumer products. Often they acted upon this initial outreach by reading about these products in consumer publications, or visiting stores to examine the wares.

Consumers who are blind complained about commercials that were primarily visual, or that provided telephone numbers with catchy word phrases (for example, a telephone number like 284-ROCK). Radio Reading Services were an alternative they discussed. Participants who are deaf or hard of hearing disliked commercials spots that relied upon sound to identify telephone numbers, addresses, or other relevant product information. Aside from these issues, consumers with disabilities had access to product information that their counterparts without functional limitations relied upon as well.

Participants discussed avenues for data collection on assistive devices. Consumers gathered information through word of mouth recommendations from friends or support group members with similar disabilities, and through voluntary organization consumer networks. They read disability-related publications and catalogues that cover technologies and turned to occupational therapists, vocational rehabilitation counselors, and independent living center staff for assistance. Several individuals cited the state projects funded under the Technology-Related Assistance Act for Persons with Disabilities (P.L. 100-407) as helpful resources.

One participant explained that each resource he used helped him to uncover additional referrals. Information, although voluminous, was fragmented. This finding was consistent with results from past years of the Consumer Needs Assessment Study.[9] A consumer commented, "You could make a life out of doing research."

This plethora of information sources did not alleviate obstacles consumers constantly face in figuring out what devices actually exist in the marketplace, and which ones would be most appropriate and useful to them. Many participants felt overwhelmed, uncertain on where to start or how to formulate thoughtful questions when seeking device information. Some consumers explained that architectural and transportation barriers contributed to the problem by making it difficult for them to go out and comparison shop for products.

One participant expressed concern about the timeliness of data collection. For example, she learned too late about existing devices that could have helped prevent her wrist from becoming contorted.

Catalogue shopping had its supporters and detractors. Those who liked this form of purchasing viewed it as a convenience; others felt that they could not know from a catalogue description whether or not a device would meet their needs.

Consumers sought evaluative information on the advantages and disadvantages of devices, including data on how general consumer products work for individuals with functional limitations. They wanted to be "consumer literate," but felt they needed additional tools to assist them in making informed purchases.

B. Solutions

- Provide evaluative information on products from objective sources.

Consumers sought unbiased measurements of products they considered acquiring. One focus group recommended the creation of technology centers where consumers could gain hands-on experiences with assistive devices and have access to unprejudiced information on product features. Several participants wanted a publication like *Consumer Reports* to study assistive technologies. They suggested that such a journal would benefit from an advisory council consisting of persons with disabilities. They also wanted reviews of general consumer products to cover design features that relate to their ability to use these devices in *Consumer Reports* and similar mainstream publications.

- Have central clearinghouses of information on assistive technologies.

Several consumers in different locations praised the state projects funded under the Technology-Related Assistance Act. Consumers cited the programs as networks to find out about products, and to sell or exchange devices. Some participants, however, sought additional information sources. They recommended the creation of central clearinghouses, with toll free telephone numbers as a resource for device information.

- Make advertising increasingly accessible.

Consumers who are blind or have low vision recommended lots of audio information on television spots. They also suggested that the Library of Congress (LOC) include advertisements in its audiocassettes of publications for persons with functional limitations. Currently, LOC is required to delete this information.

Deaf or hard of hearing participants sought captioned commercials. These consumers could also benefit from a section in the yellow pages entitled, "Assistive Listening Devices," which does not currently exist. Consumers also recommended television and radio commercials and newspaper advertisements on assistive technologies to broaden awareness of such products throughout the general public and to decrease stigmas attached to these devices.

- Have assistive technology available in retail stores with knowledgeable salespeople able to assist shoppers.

One consumer noted that Sears offers assistive technologies through its catalogues, but does not provide showroom space for such products. Another commented on entering an AT&T store, and finding the salespeople uninformed about their company's text telephones. A participant declared, "I think products like text telephones, lights, decoders...should be a product for everyone, to be sold everywhere, to be fixed everywhere." The fragmented marketplace was criticized.

Participants sought increased access to assistive technologies and information about products prior to purchase. A participant even recommended more rental or loaner opportunities for equipment.

VIII. Consumer Observations about Specific Products

EIF focus group sessions provide participants with opportunities to comment on specific products they frequently use. Assistive devices and general consumer products were discussed. Year Four focus group participants examined mobility devices (wheelchairs and scooters). They also covered various communication tools (telecommunications devices, televisions, and computers).

A. Mobility Devices — Wheelchairs and Scooters

Participants in the mobility and manual dexterity groups addressed their use of wheelchairs and scooters, although it is important to note that some focus group members with sensory impairments also used these devices. Participants expressed mixed feelings about wheelchairs and scooters. Many people appreciated their increased mobility due to these devices; others feared dependence on the products. One participant, for instance, abandoned his electric wheelchair because he was concerned that he would lose muscle strength through its use.

A participant spoke of his satisfaction with the Roll-Aid, an attachment that turns a manual wheelchair into a powered device. He found it convenient and easy to use.

Electric scooters were criticized as being difficult to dismantle and place in vehicles. One consumer recommended that the steering handle should be designed to fold down, so that users would not need to take the scooters apart when traveling in a car or truck. Location of scooter controls was a concern raised by another consumer. The position tired the user's back.

The brakes on electric and manual wheelchairs were considered. One participant rebuilt the brakes on his electric wheelchair. The brake moved backwards and forwards, a position that he could not use. He shifted the lever so that it worked up and down, with a slight forward tilt. Another consumer recommended a bicycle brake to lock chairs into position; another suggested circuit breakers on electric wheelchairs.

The problem of going up or off high curbs in wheelchairs was discussed. One consumer thought that a device should be developed that could lift up and pull a wheelchair forward. Another focus group member felt that by changing the front wheels on a wheelchair, footplate breakage would be avoided. Other suggested improvements included developing heavier scooter tires for difficult terrain and larger front wheels on chairs to promote smoother movements.

Wheelchair and scooter batteries received much attention. Consumers felt that they received inadequate warnings as to when their batteries were dying down. Batteries can contribute to magnetic interference with other devices (for a detailed discussion of this issue, see page 25). One consumer asked industry representatives whether it would be possible to put shielding around the batteries. She was told that the only way to accomplish this would be to put heavy metal around it with grounding strips that would drag out behind the user while moving. This was not a workable solution.

B. Communication Devices

1. Telecommunication Devices

a. Blind and Low Vision Focus Group Findings

Consumers spoke in detail about telephone controls. They tended to dislike small pushbuttons. Some participants had difficulties with pushbuttons; others found rotary dials a problem. One focus group member recommended that large square buttons be placed on telephones.

Several participants suggested that telephones with additional buttons (beyond 0 to 9, the # and * signs) be standardized for easy use. Different types of buttons and controls on business, home, and cordless phones were problematic for this consumer market. A focus group member told of having set her work telephone on call forwarding inadvertently. She had not realized it because the only cue for this function was visual, a small red light.

Consumers wanted yellow and white pages directory assistance easily accessible to them. They needed names, addresses, and telephone numbers. How to locate services nearby was the concern of one focus group participant, and what to do when an individual did not have the correct name of a person or company the caller wished to contact was also an issue. One focus group member recommended having telephone directories available via computer. Another sought a menu where one would dial information and press buttons to receive either phone directory. A caller could use the telephone to scan information.

b. Deaf and Hard of Hearing Focus Group Findings

These participants considered three forms of telecommunications: telephones, text telephones (which are sometimes referred to as Telecommunication Devices for the Deaf, TDDs), and telephone relay services. Relay services use a third party to interpret messages between text telephone users and those with voice telephones. They commented on available products, current efforts in serving deaf or hard of hearing customers, and changes they hoped for in the future.

1) Telephones

Participants who are hard of hearing complained about telephones that are compatible with T-switch hearing aids. Those who do not use a T-switch hearing aid receive feedback noise on telephone calls. A consumer wanted telephones that had adjustable phone receivers that would be adaptable to different kinds of hearing aids. He also recommended identification on the device that would show its affinity with T-switch hearing aids. Another participant felt that telephones should be made with portable loops instead of handsets for T-switch users.

Recommendations were made to change the shape of telephone receivers. One participant thought that telephone receivers should be large and round so that they would fit over the whole ear. This configuration would benefit those who use behind the ear hearing aids.

A participant discussed an AT&T phone that she had liked and used. It had a two levers, one to raise the ringer volume, and another to raise the volume control. She tried to buy another one, but found the model was no longer available.

Cordless phones were problematic, causing loud tones to occur when telephone numbers were incorrectly dialed. This noise was painful to one user.

2) Text Telephones

Regular use of text telephones uncovered several problems. Consumers explained that noise interference can play havoc with text telephone electronics, causing garbled messages to appear on the screen. It was often hard for a text telephone caller to decipher if a telephone line was busy, ringing, or actually represented a misdialed number. The light indicator on the text telephone was not always clear, failing to adequately inform the user of the status of the telephone call. The lighting needed refinement.

Focus group members complained that they had difficulties in finding out whether a telephone number they were trying to reach had been changed or disconnected. The information appeared on screen in a distorted format.

Several participants felt that existing text telephones could be improved. Incorporating ASCII text and computer use in telecommunications could quicken the pace of communications. The physical structure of the device could also be changed. Consumers suggested the creation of a row of keys with shorthand abbreviations of concepts such as pause or hold. These keys would allow users to add information to their messages in a shortened time period. Text telephones should be made to handle headsets of varied shapes to give consumers choice.

Another suggested innovation involved the development of the ability to interject comments during text telephone conversations. Currently, a text telephone user must wait until the person at the other end of the line is finished formulating written comments. Consumers also wanted voice messaging and call waiting services adapted to text telephones. Others suggested telephone answering machines that could process both voice and text telephone messages.

Funding for text telephones was considered. Some advocated for the provision of free text telephones. They cited that some states already have such policies.

3) Relay Services

Relay services came under review in several focus groups. Consumers criticized relay services because they were underfunded, understaffed, and constantly busy. A consumer claimed that messages often get confused within the system. Another participant commented that he was unable to start his own business, since he could not rely on the relay service to receive and make calls to non-text telephone users. He could not afford to hire a secretary to handle these telephone transactions.

A participant complained that her mother was contacted by the relay service to pass messages along to her. She felt that was an invasion of privacy, an inappropriate procedure to follow.

Several focus group members in one site were involved in improving their state's relay system. The Americans with Disabilities Act requires relay services to be fully operational by July 26, 1993. These consumers were working toward 24 hour a day service, unlimited usage and numbers of calls, fully trained operators, and standardized protocols. They thought strong consumer involvement was crucial to influencing everyday operations of the system.

c. Manual Dexterity Focus Group Findings

Opinions differed on the types of telephone controls consumers preferred to use. Some focus group members relied upon rotary phones and detested pushbuttons; others could manipulate pushbuttons more easily. A consumer stated a predilection for Trimline phones. Speaker phones were praised by those unable to lift the telephone receiver. Inexpensive, cordless phones were criticized as being difficult to recharge. For mouthstick users, big telephone buttons were helpful when dialing. Several participants mentioned that telephone memory functions were most helpful features.

Consumers felt that public telephones required reconfiguration. They needed more time than is currently given to place change in the machine to make calls. The height of the coin slot must be changed. Several people suggested that public telephones be made lower and wider, so that they are easier to reach.

d. Mobility Impairment Focus Group Findings

Problems were identified with cellular telephones and cordless phones. Expense was an issue, and cordless phones worked poorly after recharging. Several participants liked memory features and speaker phones. Large buttons were also appreciated.

A participant had a headphone, but needed assistance to put it on. He wanted a device that would hang from his ear, similar to a stethoscope.

Consumers complained that callers often do not let the phone ring long enough. They were unable to reach the telephone in time to receive calls.

2. Televisions

Specific issues related to television sets were outlined in the sensory impairment groups. Those findings follow below.

a. Blind and Low Vision Focus Group Findings

Participants wanted the practice of descriptive narrative extended to television programs generally. A participant explained it this way, "When you're visually impaired or blind, you miss out

on what's going in all those silences. Or even when there's a great deal of noise and people are shooting one another up...you can't see who's shooting who [sic]."

Consumers mentioned such issues as visual storm warnings, or telephone numbers that are flashed across the screen. These visuals must be supplemented by audio announcements, providing access to those who are blind or have limited vision.

b. Deaf and Hard of Hearing Focus Group Findings

Consumers want full captioning on all television programs. This service is currently not available. Complaints were made about news programs, where live on-the-scene reporting is not covered by captioning. Several people complained about the captioning on a new Zenith television. The enlarged print took up half the screen. Consumers wanted to see the television picture better. They speculated as to whether Zenith had sought input from consumers who are deaf or hard of hearing.

Participants mentioned problems with storm warnings that were developed as voice-overs. They needed captions to explain impending weather problems.

3. Computers

a. Blind and Low Vision Focus Group Findings

A consumer commented that computer programs that rely on graphics (e.g., Microsoft Windows), are "user friendly to sighted people, but not very user friendly to blind people." Focus group members explained that computer scanners have problems with graphics or diagrams; they are unable to process the information. Speech programs for computers are only useable when the screen is in ASCII, graphics will not work. Consumers recognized the importance of finding ways to access and interface with graphics. This was a major concern.

b. Deaf and Hard of Hearing Focus Group Findings

Computers were seen as a means to assist consumers who are deaf or hard of hearing in conversing over standard telephone lines. They could serve as part of a workstation in the home. One improvement discussed within the focus groups was to translate computer beeps into lights for use by this consumer population.

c. Manual Dexterity Focus Group Findings

Two problems affecting computer use came up in the manual dexterity focus groups. A user explained that her limited dexterity often caused computer keys to continually repeat. A fellow group member suggested that she could have that feature canceled in her machine. Reaching around to the side of the keyboard to use certain functions was also discussed. Possible remedies were not covered in the focus group sessions.

d. Mobility Impairment Focus Group Findings

Computers generated much interest in mobility impairment focus groups. A participant commented, "I think many of the conveniences that can make it easier for us in the workplace and at home...are going to end up being brought to us by way of computer." Several people wanted to learn to use them; others with computer experience talked of using a mouse with the device. Hitting keys simultaneously was a problem for some computer users. Computers and related software packages were covered when participants cited wish list items they wanted.

IX. Consumer Advice to Manufacturers

Consumers in all functional limitation groupings recognized the need for more active partnerships between those who make devices and those who use them. All groups expressed interest in working with manufacturers to help identify needs and turn them into products. Many participants were eager to test out prototype devices. Others sought to participate on company advisory boards. A focus group member expressed this idea succinctly, "Go to the consumers, get their feelings, see where we're coming from.... We're the experts."

Other suggestions for manufacturers included having trial periods for assistive devices with full refunds guaranteed, and making loaner equipment available in any part of the country. A consumer wanted braille overlays for microwave ovens available from manufacturers at no cost. A participant who is hard of hearing recommended good sound proofing of exhibits booths at conventions and technology fairs. She also felt company representatives needed training in how to present their products. She was shown an amplifier that was turned on at full blast, causing her great discomfort.

Persons with functional limitations wanted their product needs considered within a broad context. One woman explained that manufacturers need to "remember that persons with disabilities have families, spouses, and friends. We're part of a whole group. Think of how devices impact on...other people."

X. Wish List Items

Each year of the Consumer Needs Assessment Project, the EIF moderator poses a question to participants regarding wish list items.[10] Year Four focus group members readily answered this inquiry about items they want or need. They spoke often of devices in the marketplace that they could not afford and of futuristic ideas that they hoped could be turned into products. They also mentioned wishes unrelated to products that provide insights into their general needs.

Many participants mentioned devices that currently exist, but they did not know that these products were available. Fellow participants sometimes informed their colleagues that these products were obtainable. Silence, however, often followed the initial comment. It is unclear whether that silence meant a general lack of knowledge about certain products, or a hesitancy to speak on the issue.

What follows are the lists generated from the focus group participants.

A. Blind and Visually Impaired Focus Group Wish List Items

1. Communication Devices

- Portable scanning device for use in the home, workplace, and community. It would inspect different kinds of digital displays and provide an auditory or braille read-out (e.g., airline departures). Perhaps this could be accomplished by standardizing the program in digital displays causing voice readouts to occur when using the product.
- Bar code scanner for use in grocery stores, possibly located in the grocery cart.
- Lightweight, inexpensive scanner to review mail and other forms of visually displayed information.
- Lightweight (18 oz.), inexpensive intelligent video camera with descriptive narrative component that transfers information into speech or braille.
- Device that could read handwriting, sheet music.
- Device to read menus on the wall in fast food restaurants.
- Kurzweil reading machine.
- Access to current reading materials, available on computer disk.
- Closed circuit television.
- Improve closed circuit television by increasing magnification, making brighter images, providing more contrasts.
- VTEK reading machine.
- Inexpensive refreshable braille.
- Device that takes print and turns it into braille.
- Laptop computer with a built-in, one-line braille display.
- Voice synthesizers with speech that sounds more human, pleasant to the ear, and easier to understand than available systems.
- Amplification in speech synthesizer headset that isolates noise from other people.

- Portable software package that would enlarge print on the computer screen in the workplace.
- Talking fax machine.
- Phone books that are readable by blind people.

2. Mobility Devices

- Capsule to transport user wherever rider wants to go.
- Device that clips to belt or purse that could pick up an electronic signal given by traffic lights. It could have a vibrating function for those who are deaf/blind.
- Portable, lightweight radar or sonar sensor to identify objects in the way. Device could be placed in eyeglasses.
- Sounding system on traffic lights.
- Brailled elevators.
- Device that informs user of bus destinations, street signs, and store names.
- Braille maps.

3. Household Appliances

- More tactile controls and voice responses in products such as microwave ovens, televisions, VCRs, and computers.
- User friendly VCR.
- More computer games for people with visual impairments.
- Distinguishable and different kinds of lids on household products (e.g., shampoos, creme rinses).

4. Health Related Devices

- Refreshable braille thermometers.
- Inexpensive talking thermometers or thermometers that provide large print readouts.
- Device for measuring medicines for a baby.

5. Assistive Devices

- Accurate braille watch.
- Adjustable nail stencils to put on nail polish independently.
- Portable, affordable bill identifier.
- Arm to hold binoculars while watching television.

6. Other Wishes

- Increase access to all kinds of information by telephone.
- Make braille publications available at the cost of print materials.
- Better mass transit.
- Safer access on streets so individual does not have to worry about dangers posed by cars or fellow pedestrians.
- Develop pedestrian overpasses on highways.
- To be able to drive again.
- Read mail independently.
- Lower technology prices.
- More dialogue in movies.
- More descriptive narratives to know what is happening in movies, on television, and in sports events.
- Develop an I.Q. pill for sighted people to change negative attitudes.

B. Deaf and Hard of Hearing Focus Group Wish List Items

1. Communication Devices

- Portable device that translates speech into print.
- Voice telephone to text telephone hookups via computer.
- Affordable, compact, colorful, portable text telephones.

- Picture or television telephones where callers can see one another.
- Pocket computer with memory.
- Telephones that the user could tell whether or not the person at the other end is using a text or voice telephone by the nature of the ring. In households with both hearing and non-hearing persons, the deaf or hard of hearing person often picks up the phone to someone using voice.
- Telephone, similar to a computer, that has a memory and voice so that user can type messages that can be turned into speech. The telephone would have a taped message, explaining the user is unable to respond to voice calls.
- Voice recognition systems that would change voice into print automatically (radio, public address systems).
- Directional microphone that blocks out extraneous noises in loud settings.
- Amplified portable and car telephones.
- 24-hour central telecommunications relay services.
- Device that can help user decipher where noise is coming from.
- Cordless text telephone so calls could be made or received when stopped in a car parking lot.
- CART services availability at meetings, where text could be sent simultaneously to different sites.
- Pay text telephones everywhere.
- Captioned movies, television shows, commercials.
- Telephones that can automatically translate voice to print, and print to voice, without requiring text telephones or relay services.
- Captioned radio programs.
- Automatic redialing on text telephones.
- Amplifiers on all phones.
- Stronger telephone amplification that eliminates feedback for those using hearing aids.
- Answering machine for text telephone.

- Long term batteries for hearing aids.
- Fax machines with visual cues, informing users when a transmission can be made.
- Audio loops for amplification while in cars.
- Car radio speakers placed above riders.

2. Mobility Devices

- Visual system to let driver know whether something is wrong with the car.
- Larger flashing light for turn signal, since this light is currently hard to see in the daytime.
- Flashing light on car dashboard or windshield to alert driver of police or ambulance siren. It could identify a variety of sounds at different frequencies. This feature could also benefit hearing persons who have the radio on high volume with closed windows.
- Visual alarm for automobile, so driver is alerted that keys have been left in the car.
- Information on car windshield identifying miles per hour being travelled.

3. Household Appliances

- Warning device to let consumer know if fixtures or appliances are left on (faucet, iron, stove). It could take the form of a panel within the house.
- Pocket warning device which allows user to check on systems while away from home.
- Portable remote control or vibrating beeper that informs user when appliance cycles are over. Perhaps special captions would indicate that the refrigerator is open, or the washing machine is done.
- Device that alerts consumer to the need for house repairs (e.g., plumbing).
- Flashing control lights on a microwave oven.
- Wrist beeper to identify phone rings, doorbells, or a door knock.
- Visual warning that will light up on the computer to identify misspelled words.

4. Health Related Devices

- Device that alerts consumer when smoke detectors go off in different parts of the house.

- Bright lights that warn users of dangers (e.g., baby monitors, burglar alarms).
- Protection against lightening interrupting usage of devices on which the consumer is dependent.
- Flashing warning lights that are located on one's eyeglasses or in one's watch.

5. Assistive Devices

- Heavy duty hearing aids (e.g., for use when participating in sports activities).
- Vibrating clock.
- Glasses that allow user to read captions on newly released movies.
- Hearing dogs.

6. Other Wishes

- Free or tax deductible devices.
- More sign and oral interpreters.
- State distribution of free text telephones and captioners, targeting children specifically.
- More sign language television programs.
- Teach all hearing people sign language.
- Develop housing that accommodates people with multiple disabilities.
- Educate the hearing public so that they know how to communicate with those who are deaf or hard of hearing.

C. Manual Dexterity Focus Group Wish List Items

1. Communication Devices

- Inexpensive, cordless phones.
- Voice activated telephones, computers.
- Light Talker (an augmentative communication device) and computer.

, the company will not sell the device

- Prentke–Romich touch top keyboard. C
independently.

stand speaker.

- Device to translate speech so listener car

nicate.

- More devices to help nonverbal people c
- Emergency Alert System.

2. Mobility Devices

r sand and that helps user off steps and curbs.

- Power wheelchair that could operate on

dependently.

- Device to allow user to enter and exit h
- Device to assist hand movement.
- Device to open door.
- Lightweight, long lasting, self–charging
- Less sensitive wheelchair controls.
- Riser chairs.
- Tread operated doors.
- Car that user is able to get into and out

pendently.

3. Household Appliances

- Eye activated devices.
- Sip and puff controls to activate one's h
- Environmental controls.
- Useable bottle opener.
- Wheel–in shower.
- VCR that would eject tapes via remote
- Lightweight hedge clippers.

4. Assistive Devices

- Stronger, sturdier reachers and dressing sticks.
- Mechanical PCAs.

5. Other Wishes

- Have the ability to speak for oneself.
- Have the capability to access the environment independently.
- Have more support group opportunities to interact with others in social situations.

D. Mobility Impairment Focus Group Wish List Items

1. Communication Devices

- Telephone attached to home intercom system, so wherever consumer was located, the telephone could be accessed.
- Waterproof cordless telephone.
- Emergency Alert System for use in the home and on the road as an alternative to expensive cellular telephones.
- Economical emergency beeper.
- Speech boards that could be attached to telephones when conversing.
- Computer disks that could be put into rotating disks and placed into the device, similar to a juke box.

2. Mobility Devices

- Collapsible, lightweight wheelchairs that fold up small.
- A new van.
- Device to start van from inside one's house, have it running and warmed before driver goes outside in the wintertime.
- Electronic heat in driveway concrete to keep it clear of ice in the wintertime.
- A strap-on jet pack to take user where he or she wants to go.

- A portable gadget to lift user out of chairs.
- Bar stool with wheels to move around the kitchen.
- More electronic doors.
- Voice activated car with citizens's band radio.
- Electrically tilting bed that can assist the user to turn.
- Vans with lowered floors available directly from the factory so that buyers do not need to revamp them.
- Lift that is operable with one hand.
- Conveyor belt-type sliding board.
- Device for getting into the bathtub.
- Device to rise in one's wheelchair to shift one's weight.
- Better transferring devices.
- More door openers.
- Doors that open with the use of a code.
- Portable door opening device.
- Carrying devices. (A participant complained that backpacks bend materials and pushcarts can be awkward).
- Adapt wheelchairs to get over curbs.
- Universal wheelchair lock installed in buses.
- Changeable, portable, battery rechargers.
- Device to stand user up in office setting.
- Improve shoe soles and crutch bottoms for use in icy conditions.
- Cane extension that puts out prongs in the wintertime.
- Lighter weight crutches.

- Crutch holder for use when going up or down stairs.
- Low-riding wheelchair that fits under a table.
- Easy wheelchair braking system.

3. Household Appliances

- Freezers on the bottom of refrigerators, or shorter, lower refrigerators with double doors.
- Universal remote control that services the television, lights, and other appliances. For those with problems pointing, a holder for an electric controller can be strapped to the head.
- Computers to turn lights on and off and lock doors.
- A device to roll a garbage can down the street for trash pickup.
- Self-propelled vacuum cleaners.
- Dust pans with long handles.
- Front loading washing machines.
- Handicapped accessible housing units where light switches and temperature gages are low. "Everything needs to be within range."
- Can opener usable with one hand.
- Voice activated devices (e.g., televisions).
- Counters low enough for a wheelchair user to roll under.
- Affordable voice activated software.

4. Health Related Devices

- Massager to stimulate circulation while using wheelchair. It could be a pocket-size, programmable sequencer, attached to one's clothes that could stimulate and help build muscles such as calves and thighs.
- Forklift-type device to enter and exit from a pool.

5. Assistive Devices

- Trained animals, such as monkeys or dogs, to assist people with mobility impairments.

- More clothing products with velcro.
- Better ways to put on clothes.
- Inexpensive, professional looking clothing that fits well and that does not appear as if it came out of a hospital setting.
- Attractive necklaces without difficult clasps.

6. Other Wishes

- Financial assistance for computer purchase.
- More equipment loan closets.
- To be able to dress independently.
- Have device experts come into one's home to conduct evaluations.
- Make third party approval and payment for customized wheelchairs occur faster.

XI. Conclusion

Consumer Needs Assessment Project Year Four focus group participants willingly shared their opinions on issues and products that affect their daily lives. They identified clearly the obstacles they face in using technologies effectively. They articulated specific problems and concerns, while recommending possible solutions to make products and services readily accessible to their diverse consumer market.

Many needs identified by employed and unemployed focus group participants overlapped. Unmet needs included policy issues related to attitudes towards disability, human assistance, public and private transportation, and public accommodations. These needs touched the lives of all focus group members. Each unmet need could benefit from policy interventions and the development and dissemination of varied devices. Responses to these quality of life issues were outlined in the text of this monograph.

Product features such as cost, control formats, accessible instructions, repairs, and product compatibility were raised by those who were working and those who were unemployed. These issues concerned participants in all functional limitation groupings independent of individual work status.

Differences arose most commonly when discussions turned to workplace issues. Unemployed focus group participants explained the barriers to and disincentives they faced in the job market. Those working part-time tended to address problems related to health and Social Security benefits. Those who appeared most comfortable commenting on technology in the workplace were employed,

recently unemployed, or volunteers in offices. Participants who had no prior working experience or limited exposure to the job market seemed less inclined to hypothesize what their needs would be in the work setting. Most of the focus groups considered the Americans with Disabilities Act, its potential, and its far reaching implications for all aspects of their lives.

Access to product information was a major obstacle for Year Four focus group participants. They realized that many products exist in the marketplace, and told of their methods for uncovering information. They freely conceded, however, that access to objective, evaluative information pertaining to their product needs was difficult to find.

Participants made observations about specific products, citing problem features and needed improvements. They advised manufacturers on ways to make products more accessible to people with disabilities. Their major recommendation was that as consumers with functional limitations they ought to be consulted and involved in the product design and development process. Such inclusion will help to make products that are useable by and acceptable to those with disabilities. Consumer savvy regarding product issues was evidenced in Year Four focus group sessions.

ENDNOTES

1. See Year Four Moderators Guide, Attachment I.

2. See Attachment II.

3. See Acknowledgements, page i.

4. Kraus, L.E. and Stoddard, S., *Chartbook on Disability in the United States, An InfoUse Report*, U.S. National Institute on Disability and Rehabilitation Research, Washington, DC, 1989, pages 36–38.

5. Vachon, R.A., "Employing the Disabled," *Issues in Science and Technology*, Winter 1989–90, page 44.

6. See Ward, C., "Increasing Independence Through Technology: The Views of Older Consumers With Disabilities and Their Caregivers, Consumer Needs Assessment Project Year Three, Results from the Third Year of a Five Year Study," Electronic Industries Foundation, Washington, DC, 1991, pages 5–7.

7. Ward, C., "Increasing Independence through Technology", page 9.

8. Ward, C., "Increasing Independence Through Technology", page 10; Ward, C., "Design for All: Consumer Needs Assessment Project Year Two, Results from the Second Year of a Five Year Study," Electronic Industries Foundation, Washington, DC, 1990, page 6; Phillips, L., "Consumer Needs Assessment, A Qualitative Study of the Needs of People with Disabilities, Consumer Needs Assessment Project Year One, Results of the First Year of a Five Year Study," Electronic Industries Foundation, Washington, DC, 1989, page 6.

9. Ward, C., "Increasing Independence Through Technology," pages 20–22; Ward, C., "Design for All," page 12; Phillips, L., "Consumer Needs Assessment," page 6.

10. Ward, C., "Increasing Independence Through Technology," pages 23–31; Ward, C., "Design for All," pages 27–31; Phillips, L., pages 9–10, 13.

ATTACHMENT I

Moderator's Guide Year Four

Introduction

The goal of this focus group session is to find out, from your perspective, about types of technology that can help you in your daily life. I ask you to share your opinions on devices that fall into two broad categories:

- devices specially designed to assist persons with disabilities — wheelchairs, reachers, hearing aids;

- general consumer products — can openers, telephones, TVs, ovens, refrigerators, computers.

All kinds of products are open to discussion. The aim is to consider what works for you, what doesn't, and why. This research seeks to discover whether and/or how devices can be improved to better meet your needs.

Issues for All Consumers

I. Impact of technology on the lives of unemployed or employed working-aged persons with disabilities.

Briefly describe the limitations you have.

What devices, either adaptive equipment or general consumer products, do you use to help you compensate for physical limitations? For what purposes do you use these devices?

Think about other products you have in your home — these include devices that assist you in: personal care or grooming, mobility, communicating, eating, preparing meals, household chores, or recreation and entertainment. Are you able to use all these appliances without assistance? If not, why?

Are there ways that designers and manufacturers could change these products so that you could use them independently? Have you come up with modifications to products that have allowed you to use them more effectively? Cite examples.

Let's discuss what criteria you apply when you select products for home and workplace use.

Have you ever considered obtaining certain devices, but then decided against acquiring them? Why (e.g., they are difficult to operate)? Please identify specific examples.

How do you manage such activities as laundry and housekeeping?

Have you ever worked outside of the home? If so, what kinds of equipment did you use to function on the job? Do you have any ideas on what kinds of products could have helped you in a work setting?

Are you currently working? If so, what kind of equipment do you use to function on the job? Do you have any ideas on what kinds of products could help you in a work setting?

Can you identify other products that help you to participate in activities outside of the home or the workplace, such as when you attend church, go to the movies, go out to eat, or travel? How do these devices assist you?

II. Feelings about using devices

If you had to choose one device you depend on the most, what would it be? How would you manage without it?

What features do you like about this device? Why?

What features do you dislike?

If you had to choose one device that you most enjoy using, what would it be? Why?

If you had to choose one device you do not like to use, what would it be? Why?

Can you discuss, in general, features that you like or dislike in devices (e.g., size, weight, appearance, cost)?

Have you thought about ways that products you use could be improved? Cite examples.

III. Actual experiences with and attitudes towards devices in these settings

What questions do you ask when considering purchasing new products?

Can you discuss any positive experiences you have had using equipment? Conversely, have you had bad experiences with devices that have caused you to avoid using the equipment? Please be specific.

Are there devices you have used and abandoned? Or devices someone gave you that you did not use? How were these devices acquired? Why do you not use them?

IV. Transportation issues

Let's discuss issues related to public and private transportation. How do you get around?

What kinds of activities do you attend outside of the home (church, sporting events, concerts, meals out, shopping)? What issues do you need to take into account in participating in such outings?

V. Activity issues

How do you spend your time? Can you think of devices you could benefit from that you do not currently have?

If you could, would you like to work? Why? Why not? What devices, if any, would allow you to work? What other factors would affect your decision to join the workforce?

Discuss your workplace experiences. What factors influence your ability to perform your job effectively? How could the workplace environment be improved for you?

VI. Knowledge of what exists, benefits and disadvantages

How do you learn about general consumer products?

How do you learn about assistive devices?

Are these sources of information adequate?

What kinds of information do you need to assess whether a particular device, either a general consumer product or an assistive device, is right for you?

Are there other methods of finding out about devices that would be more helpful to you? What are they?

VII. Financial issues

How do you pay for assistive devices? Are there products you have wanted for which you haven't been able to find financing? What are they?

What external sources, if any, have helped you purchase devices for general use? In the workplace?

What features in a product would you be willing to sacrifice to reduce its cost?

VIII. Other issues

What piece of equipment do you wish you could have? What prevents you from acquiring it?

Is there something you would like to see invented that doesn't currently exist? What is it?

What would you like to be able to do that you are unable to do now? Can you think of a device that may be able to assist you in doing this?

Is there any topic related to technology that we still need to cover?

Are there other issues we need to discuss?

IX. Thanks and conclusions

ATTACHMENT II

Electronic Industries Foundation
Monographs on The Consumer Needs Assessment Project

"Consumer Needs Assessment, A Qualitative Study of the Needs of People with Disabilities, Consumer Needs Assessment Project Year One, Results of the First Year of a Five Year Study," Lynn Phillips, August 1989.

"Design for All: Consumer Needs Assessment Project Year Two, Results of the Second Year of a Five Year Study," Carolyn Ward, July 1990.

"Increasing Independence Through Technology: The Views of Older Consumers with Disabilities and Their Caregivers, Consumer Needs Assessment Project Year Three, Results of the Third Year of a Five Year Study," Carolyn Ward, September 1991.

"Listening to the Experts: The Views of Working Aged Persons with Disabilities, Consumer Needs Assessment Project Year Four, Results of the Fourth Year of a Five Year Study," Carolyn Ward, July 1992.